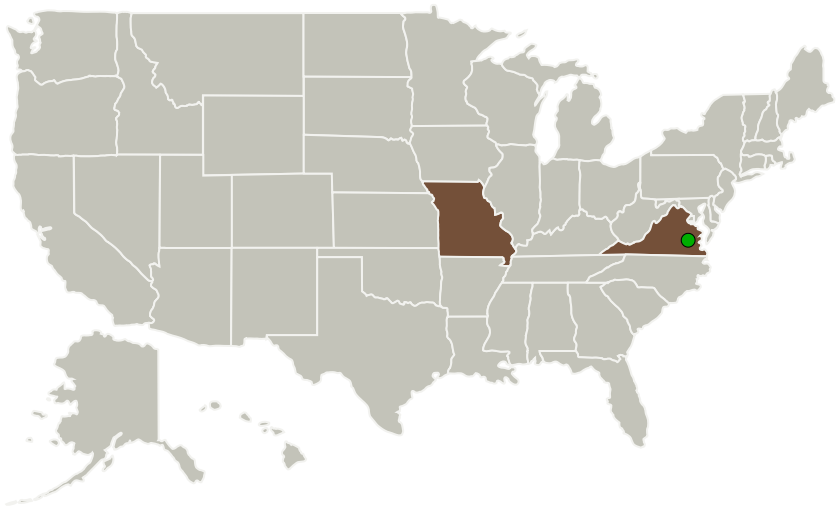
Identification of Landing Gear Aeroacoustic Noise Sources with the Synthetic Array Technique, Phase I

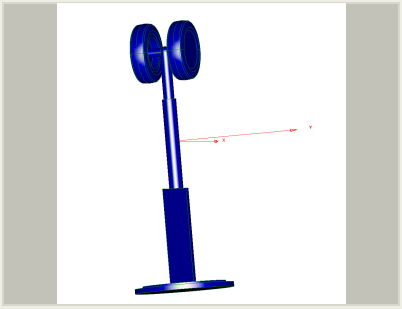
Completed Technology Project (2013 - 2013)

Project Introduction

In this program, Innovative Technology Applications Company (ITAC), LLC and collaborators propose to advance "synthetic phased array" technology to improve understanding of noise from landing gear. The technology, initially developed in a previous NASA SBIR project for trailing edge noise, will be applied to improve beamforming analysis methods, facilitate the design of more effective microphone arrays, and significantly enhance the understanding and characterization of noise sources from landing gear. The proposed approach involves the use of Large Eddy Simulation (LES) to generate data on the nearfield unsteadiness in jet flows. The nearfield noise is then numerically propagated to the farfield phased array microphone locations. Beamforming analysis methods will be used to predict noise source locations, and these predictions will then be compared with the original LES results. Discrepancies between the phased array prediction and the LES flowfield results will be used to guide development of new and improved phased array source models, as well as develop improved methods for positioning Ffowcs-Williams Hawkings (FWH) integration surfaces around complex noise-generating configurations such as landing gear. When fully developed, this technique offers the potential for significant benefits. First, it will empower experimental aeroacoustics researchers to customize the layout of microphone arrays for a given experimental configuration. Similarly, this approach offers the potential to customize the analysis of the recorded data they take for optimum accuracy. Beyond this, the improved FWH and beamforming methods that will be developed using this technique will benefit any experiment which makes use of phased arrays of microphones. Finally, the work will add to the overall understanding of landing gear noise.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Innovative Technology Applications Co.	Lead Organization	Industry	Chesterfield, Missouri
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Missouri	Virginia

Project Transitions

May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138621)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Innovative Technology Applications Co.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

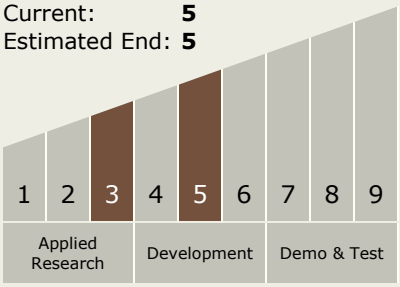
Carlos Torrez

Principal Investigator:

Christopher C Nelson

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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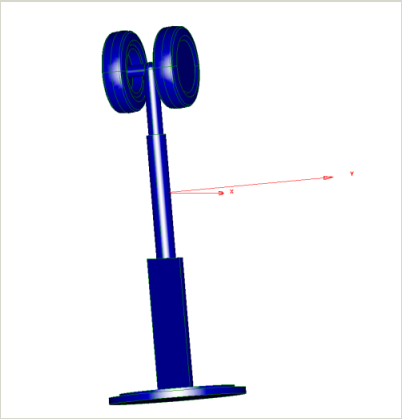
Images



Project Image
Identification of Landing Gear Aeroacoustic Noise Sources with the Synthetic Array Technique
(https://techport.nasa.gov/image/133428)

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.4 Aeroacoustics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System